SECTION 1
INTRODUCTION

QUESTIONS THIS SECTION WILL ANSWER		PARA.
1.	What is the scope and purpose of this handbook? Who should use it?	1.1
2.	To what other documents is this handbook related, and what is the nature of the relationship?	1.1
3.	How does the user locate specific information related to each life cycle phase and CM function?	1.2
4.	What is configuration management?	1.3
5.	What is the Government's role in the CM process; what is a contractors role; and how are they related?	1.3.1
6.	How does CM impact program costs?	1.3.2
7.	What are the benefits of having effective CM on a DoD program?	1.3.2
8.	What are the risks associated with the lack of CM, or ineffectual CM?	1.3.2
9.	What are the basic CM definitions used in this handbook? What is the "correct" CM terminology to use on a DoD program/project?	1.4

1.1 Scope and Purpose.

The purpose of this military handbook is to provide guidance and information to DoD acquisition and material Program Managers and individuals assigned responsibility for Configuration Management to assist them in planning for and implementing effective DoD configuration management activities and practices during all life cycle phases of defense systems and configuration items. It supports acquisition based on performance specifications, and the use of industry standards and methods to the greatest practicable extent. *MIL-STD-973 which heretofore governed DoD configuration management procedures is being phased out, and is prohibited from being cited in new acquisition solicitations.*

This handbook is closely related to **MIL-STD-2549**, " Configuration Management Data Interface" and the **Electronic Industries Association (EIA) Standard 649**, "National Consensus Standard for Configuration Management" and **EIA Standard 632**, the industry standard for systems engineering.

MIL-STD-2549 details the Government configuration management information requirements. It is written to enable the Government to develop a DoD standard automated information system to manage its product information, and for both Government and industry activities to electronically share that data. It defines the logical content and relationships of the information that the configuration management information system will contain, i.e. the business rules view. **MIL-STD-2549** also describes the standard information content for the transfer of configuration management information to the Government. The DoD Configuration Management Automated Information System (CM AIS) is being developed in accordance with these business rules and includes a change document authoring and routing tool which will be accessible to any user or industry partner.

EIA Standard 649 provides the basic configuration management principles and the best practices employed by industry to identify product configuration and effect orderly management of product change. In basing its source selection on past and current performance, the Government expects its preferred suppliers to employ robust internal configuration management processes which embody those basic principles.

EIA Standard 632 describes the Systems Engineering process of which CM is an integral part. **[See 2.2.2]**

The acquisition reform environment is significantly different from one in which the Government imposed its own management requirements on contractors by military standards. Configuration management activity must be applied to items at a level which is consistent with acquisition strategy, protects the interests of the government,

and flexibly accommodates contractor standard methodology. With a major share of configuration control authority shifted to contractors, the DoD configuration management activity must still continue to provide assurance of supportability and interoperability of military equipment and software. This responsibility requires careful planning and implementation of a DoD configuration management strategy that is in concert with the acquisition, logistic support, and maintenance philosophy of each given material item.

As the DoD transitions to performance based acquisition and the use of the new standard AIS for CM, this handbook provides the insight necessary to:

- Understand the application of the basic principles of CM articulated in EIA-649 to the DoD acquisition and operational environment
- Plan for and make prudent and cost effective choices in effecting DoD configuration management activities throughout the life cycle of a material item
- Provide the necessary basis for CM in RFPs and Contracts
- Evaluate contractor proposals and CM processes
- Use the data models and data dictionaries included in **MIL-STD-2549** as a common framework for communicating configuration information among diverse, distributed data bases
- Acquire and process necessary CM information
- Measure CM performance effectiveness of both Government activities and contractors

1.2 Application of CM over the Program Life Cycle Phases

Figure 1-1 illustrates how this military handbook's content is structured to provide a comprehensive guide (roadmap) to the application of configuration management through all life cycle phases of a program. As defined in **DoD 5000.2-R,** the life cycle extends from concept studies through demilitarization and disposal. A given military program, however may not include all of the phases.

a. Section 2. CM Life Cycle Management and Planning. Since management and planning are the keys to effective implementation of CM, Section 2 provides the focus for the entire handbook. It contains an overview of the CM process, it's relationships to other processes, and Government/Contractor configuration management during the entire program life cycle. It addresses global CM Management activities applicable to all phases such as planning, process implementation and performance measurement. A series of templates **[Tables 2-1 through 2-4]** address the following for each life cycle phase:

- CM Objectives keyed to the program objectives for the Phase **[Figure 2-5]**
- CM Activities supporting those objectives
- Benefits and risks
- Metrics to assess achievement of objectives and foster process improvement
- Key actions to be taken, interfaces to be established and information needed to perform the activities
- Pointers and references to specific supporting details found in Sections 2 through 7 and Appendices.

b. Sections 3 through 7. Major CM Functions. In support of Section 2, Sections 3 through 7 contain detailed information in the form of activity descriptions, activity models, principles and concepts, and activity guides (diagrams, checklists, tables, etc).for the following topics:

- Section 3 Configuration Identification
- Section 4 Configuration Control
- Section 5 Configuration Status Accounting
- Section 6. Configuration Verification and Audit
- Section 7. Data Management

c. Appendices. The appendices to this handbook consist of additional information, supporting either the planning and information timeline in Section 2 or the details in Sections 3 through 7, that is appropriate for reference.

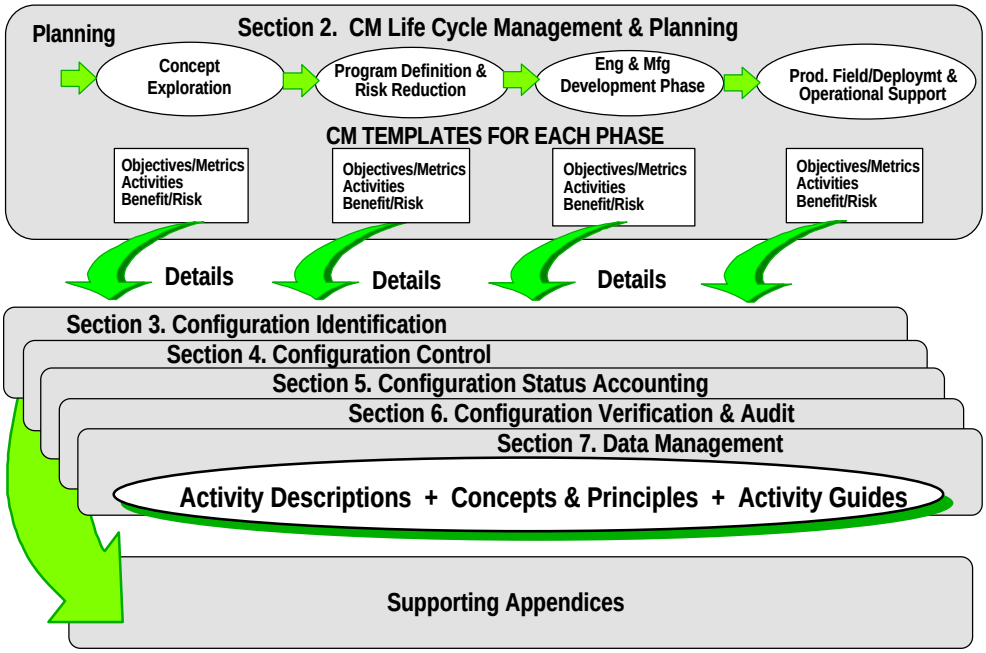

Figure 1-1. MIL-HDBK-61 Provides a Roadmap to the Application of CM in each Phase of the Life Cycle

1.3 Configuration Management Overview.

Configuration management embodies two concepts: (1) the configuration management of items and their defining technical data, referred to herein as configuration documentation; and (2) the application of CM principles to digital data in general. **[Section 7]** Because, digital data management is critical to the control of configuration documentation and therefore to the configuration management of Weapon Systems, document management rules are integral to the CM process.

Configuration management is defined[1] as a process for establishing and maintaining consistency of a product's performance, functional and physical attributes with its requirements, design and operational information throughout its life. **Figure 1-2** is a top-level activity model depicting the CM process showing:

- Inputs - the information needed to initiate and perform the process
- Constraints - Factors or information which inhibit or put limitations on the process
- Facilitators - Information, tools, methods, and technologies which enable or enhance the process
- Outputs - The results which derive from the process and the information that is provided by the process.

NOTE: Activity models in Sections 2-7 follow the above format, which is a simplification of the IDEF-0 (Activity Model) protocol.

DoD Regulation 5000.2-R states the requirement for:

> "A configuration management process to control the system products, processes and related documentation. The configuration management effort includes identifying, documenting and verifying the functional and physical characteristics of an item; recording the configuration of an item; and controlling changes to an item and its documentation. It shall provide a complete audit trail of decisions and design modifications."

[1] EIA/IS-649

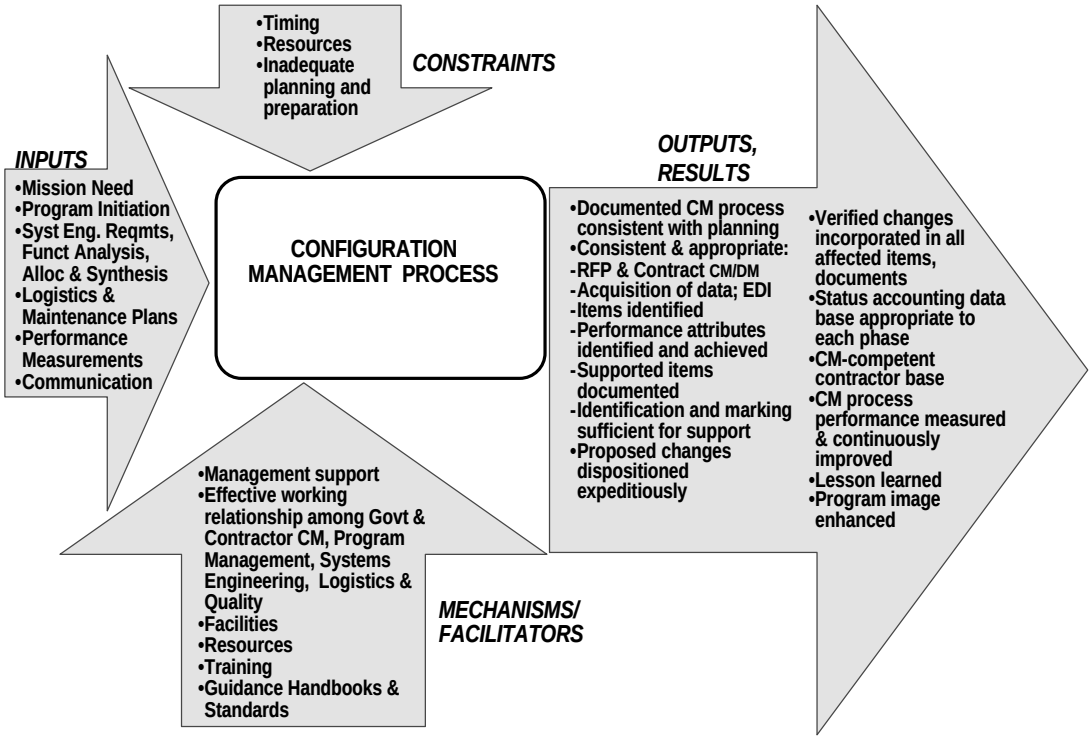

Figure 1-2. DoD Configuration Management Process Model - Overview

The CM process encompasses:

- Configuration items
- Documents which define the performance, functional and physical attributes of an item. These documents are referred to as configuration documentation.
- Other documents which are used for training, operation and maintenance of an item
- Associated and interfacing items which are used for training, operation or maintenance of the configuration item.

The CM process is embodied in rules, procedures, techniques, methodology and resources to assure that:

- The configuration of the system and/or item (its attributes) are documented **[Section 3]**
- Changes made to the item in the course of development, production and operation, are beneficial and are effected without adverse consequences **[Section 4]**
- Changes are managed until incorporated in all items affected **[Sections 4, 5 and 6]**

CM is applied to defense material, whether hardware or software, that are designated as “systems” and “configuration items.” Systems generally refer to the level at which major defense acquisitions are defined and managed. The designation of an item as a configuration item (CI) identifies the item as being a significant part of a system, or an individual item, at an appropriate level for documentation of its performance attributes and for management of changes to those attributes The concept of CIs has confused some people into thinking that the level at which they are designated is the point at which configuration management stops. In reality, the CI level is where configuration management really begins; the process encompasses, to some degree, every item of hardware and software down to the lowest bolt, nut and screw and software unit. This does not mean that the acquiring activity, the prime contractor, or even subcontractors have visibility or configuration control authority over every part. Rather it means that someone within the supply chain has configuration documentation and change control responsibility for each part.

The attributes of configuration items are defined in configuration documentation. Configuration baselines are established to identify the current approved documents. Configuration items are uniquely identified. They are verified to make sure they conform to, and perform as defined in, the configuration documentation.

Whenever a change is contemplated to an item, the effect of that change on other items and associated documents is evaluated. Changes are systematically processed and are approved by the appropriate change control authority. Change implementation involves update and verification of all affected items and documentation.

Information about item configuration, document identification and status, and change status is collected as activities associated with the CM process occur. This configuration status accounting information is correlated, maintained, and provided in useable form, as required.

The responsibility for performance of the CM process and supporting activities is shared between the Government and the contractor, and may vary over the life cycle.

1.3.1 Government and Contractor Roles in the CM Process.

Both the Government and the contractor participate in the CM process. In the context of this handbook, a Government activity engaged in design, development or production of hardware or software items is considered to be a contractor.

Since, the Government has ultimate responsibility for the performance and configuration of the systems and equipment it acquires and operates, the Government is always the configuration control authority for the top-level performance attributes, and for selected lower level performance and design attributes that it specifies and contracts for. A significant degree of authority for configuration control may be exercised by contractors during any or all phases of the life cycle, depending on such factors as type of acquisition, contractual requirements, and ownership of the data.

For a specific acquisition, configuration control authority means that the activity or organization exercising that authority controls the configuration of the product and determines what changes are to be installed or incorporated in that product.

It does not mean that the Government or any other configuration control authority can unilaterally authorize change to configuration documentation throughout the life cycle. Each configuration document has a current document change authority (CDCA), i.e. an agency or activity or organizational entity that is responsible for the content of the document and is the only authority that can effect changes to the document.

The concept of current document control authority (CDCA), introduced in **MIL-STD-2549,** establishes that configuration control authority to effect a product configuration change under a contract does not automatically mean that a change can be directed or made to a document for which another organization is the controlling design activity and has content responsibility. This concept becomes increasingly more important as DoD acquisition looks to the commercial industrial base, and it is central to the management of an automated information system concerning documentation used by different application activities. **[Details: 4.1.1.1]**

Configuration control authority of the product, and current document change authority for each configuration document can be transitioned from one organization to another.

A typical distribution of CM related roles is shown in **Table 1-1**; responsibilities included for continuity that are not primarily configuration management activity are italicized.

Table 1-1. Typical Government and Contractor CM Roles and Responsibilities

Government	Contractor(s)
Solicits concept (Systems Engineering) studies. May participate on Integrated Product Team (IPT) *Specifies desired performance attributes for a system/CI* *Selects Contractor*	*Performs system engineering studies. Determines alternative system approaches* • *Proposes Items or Design Solution*
• Approves and baselines top level performance configuration documention (specifications) and acts as current document control authority (CDCA) for those performance specifications and configuration control authority for the System/CI • Monitors contractor CM process via: - IPT participation - Metrics - Performance reviews • Baselines selected product performance configuration documentation after verifying (e.g. FCA) that performance requirements have been achieved • Continues as CDCA for selected product performance configuration documentation; may become CDCA for other documentation as contractually established	• Prepares and submits performance specification for approval. May participate with Government on IPT. • Initiates development. Incrementally baselines design solution and acts as current document control authority (CDCA) for released configuration documentation, e.g. performance and detail specifications (below the level controlled by the Government), engineering drawings, engineering models, etc. for which another, Government activity or commercial organization is not already the CDCA)
• Continues as configuration control authority for the System/CI during its life as a Government asset	• Baselines product design configuration documentation after verifying performance attributes and consistency between item and configuration documentation. (FCA & PCA) • Continues as CDCA for product configuration documentation which it does not transition

1.3.2 CM Benefits, Risks And Cost Impact.

Configuration Management provides knowledge of the correct current configuration of defense assets and the relationship to associated documents, efficiently manages necessary changes, and ensure that in accomplishing change all impacts to operation and support are addressed.

The benefits of the process should be obvious but are often overlooked. EIA/IS-649 summarizes the benefits of CM from an industry view, as follows:

Product attributes are defined.*Provides measurable performance parameters. Both Buyer and Seller have a common basis for acquisition and use of the product.*

Product configuration is documented and a known basis for making changes is established.*Decisions are based on correct, current information. Production repeatability is enhanced.*

- Products are labeled and correlated with their associated requirements, design and product information. *The applicable data (such as for procurement, design or servicing the product) is accessible, avoiding guesswork and trial and error.*
- Proposed changes are identified and evaluated for impact prior to making change decisions.*Downstream surprises are avoided. Cost and schedule savings are realized.*

Change activity is managed using a defined process. *Costly errors of ad hoc, erratic change management are avoided.*

- Configuration information, captured during the product definition, change management, product build, distribution, operation, and disposal processes, is organized for retrieval of key information and relationships, as needed. *Timely, accurate information avoids costly delays and product down time; ensures proper replacement and repair; and decreases maintenance costs.*

  Actual product configuration is verified against the required attributes. Incorporation of changes to the product is verified and recorded throughout the product life. *A high level of confidence in the product information is established.*

These benefits are equally applicable to Government and industry. Additionally, the effective application of CM principles to defense products contributes to and enhances the partnering environment desired between the DoD and its suppliers.

In the absence of CM, or where it is ineffectually applied, there may be equipment failures due to incorrect part installation or replacement; schedule delays and increased cost due to unanticipated changes; operational delays due to mismatches with support assets; maintenance problems, down-time, and increased maintenance cost due to inconsistencies between equipment and its maintenance instructions; and numerous other circumstances which decrease operational effectiveness and add cost . The severest consequence is catastrophic loss of expensive equipment and human life. Of course these failures may be attributed to causes other than poor CM. The point is that the intent of CM is to avoid cost and minimize risk. Those who consider the small investment in the CM process a cost-driver may not be considering the compensating benefits of CM and the inherent cost, schedule and technical risk of an inadequate or delayed CM process.

Throughout this handbook, selection criteria are provided to aid in making choices concerning implementation of various CM activities and functions. In each applicable instance, the means to complete a benefit/risk analysis is provided.

1.4 Definitions And Terminology.

Definition of the terms used in this handbook may be found in MIL-STD-2549 (Interface Standard) and in EIA/IS-649. Since a major goal of acquisition streamlining is to use commercial and industry practices to the greatest extent possible, there is no single correct set of CM terminology that must be rigidly adhered to. EIA/IS-649 illustrates many aliases that are commonly used in different industrial environments. It is appropriate to allow the use of terms common (local) to a given industry when dealing with that industry.

When digital data base information is being interchanged, the local terminology is translated to the standard data elements **[MIL-STD-2549, Appendix C,]** so that the standard DoD databases (JEDMICS and CM AIS) can properly interpret it.

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